Practitioner's Docket: DEE6270P0291US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

Applicant:	Paul Robert Heide		
Serial No.:	10/616,828	Group Art Unit: 3682	RECEIVED CENTRAL FAX CENTER
Filed:	July 10, 2003	Examiner: Marcus Charles	MAY 0 1 2006
For:	Drivetrain For Utility Vehicle		

SECOND DECLARATION OF PAUL ROBERT HEIDE UNDER 37 C.F.R. §1.131

1. The undersigned is the inventor of the above-identified application.

2. In an e-mail (Exhibit D) that I authored and sent to Jeff Zarembka (jzarembka@hoffcocomet.com) dated May 26, 2000, I stated my conception of the invention as the axle drive ratio being 18:1 and the overdrive being 0.76. The e-mail includes a spreadsheets attachment,"jeff.xls" also attached.

3. A specification was thereafter created and refined for purchasing the prototype components for the invention. Attached as Exhibit E are relevant pages of "Revision C" of the "Component Specification EO654 HUV" for the transaxle, issued for review by John Deere Co. and Kanzaki the supplier of the transaxle for the prototype.

4. Attached as Exhibit F is an e-mail dated December 15, 2000 from Rocky H. Page to me. A Kanzaki Kokyokoki Mfg. Co. Ltd. quote for the "EO654 1st prototype" is quoted by Kanzaki, which is in response to the John Deere "Component Specification EO654 HUV" of August 2000.

5. The transaxle according to the invention was supplied by Kanzaki according to "Component Specification EO654 HUV" of August 2000 and was installed in the prototype.

6. Photographic Exhibits A, B and C illustrate a prototype cart that existed as of at least March 8, 2001. The photographic exhibits, in electronic form, were electronically attached to an email dated March 8, 2001.

7. The prototype cart depicted in the photographic exhibits had a transaxle turn ratio of 17.38 and a maximum CVT turn ratio of 3.11/.76. The prototype had a maximum total gear ratio of 54.1 and a minimum total gear ratio of 13.2, wherein the total gear ratio is the CVT turn ratio multiplied by the transaxle turn ratio.

8. Between March 8 and March 13, the prototype vehicle was test driven and determined to operate in a satisfactory manner, thus reduced to practice, as documented in an email dated March 13, 2001 Exhibit G.

9. I hereby declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated this 1st day of May, 2006.

By: Paul Robert Heide

Paul Robert Heide

EXHIBIT A

From: Page Rocky H
Sent: Thursday, March 08, 2001 5:19 PM
To: 'T.Hasegawa'
Cc: A.Ima; A.Yoshina; K.Fujisaki; K.Otsuki; M.Usumura; T.Inoue; T.Morisaki; Karl Friesen; Larry Swanson; Paul Heide; Paul Schumann
Subject: Eo654 fit up pictures

Hasegawa-san

Here are some photos of the fit up sample mounted into the 550 mule. (Ref KK6541002)

----Original Message----
From: Heide Paul
Sent: Thursday, March 08, 2001 7:36 AM
To: Swanson Larry
Cc: Page Rocky H
Subject: Cobblejob pictures


Whole vehicle.jpg


RearleftTA.jpg


FrontrightTA.jpg

Paul Heide
heidepaul@johndeere.com
Engineer-John Deere Vehicle Group
PO Box 3540, Williamsburg, VA 23187-3540
Voice: (757) 564-2534 Fax: (757) 564-2599

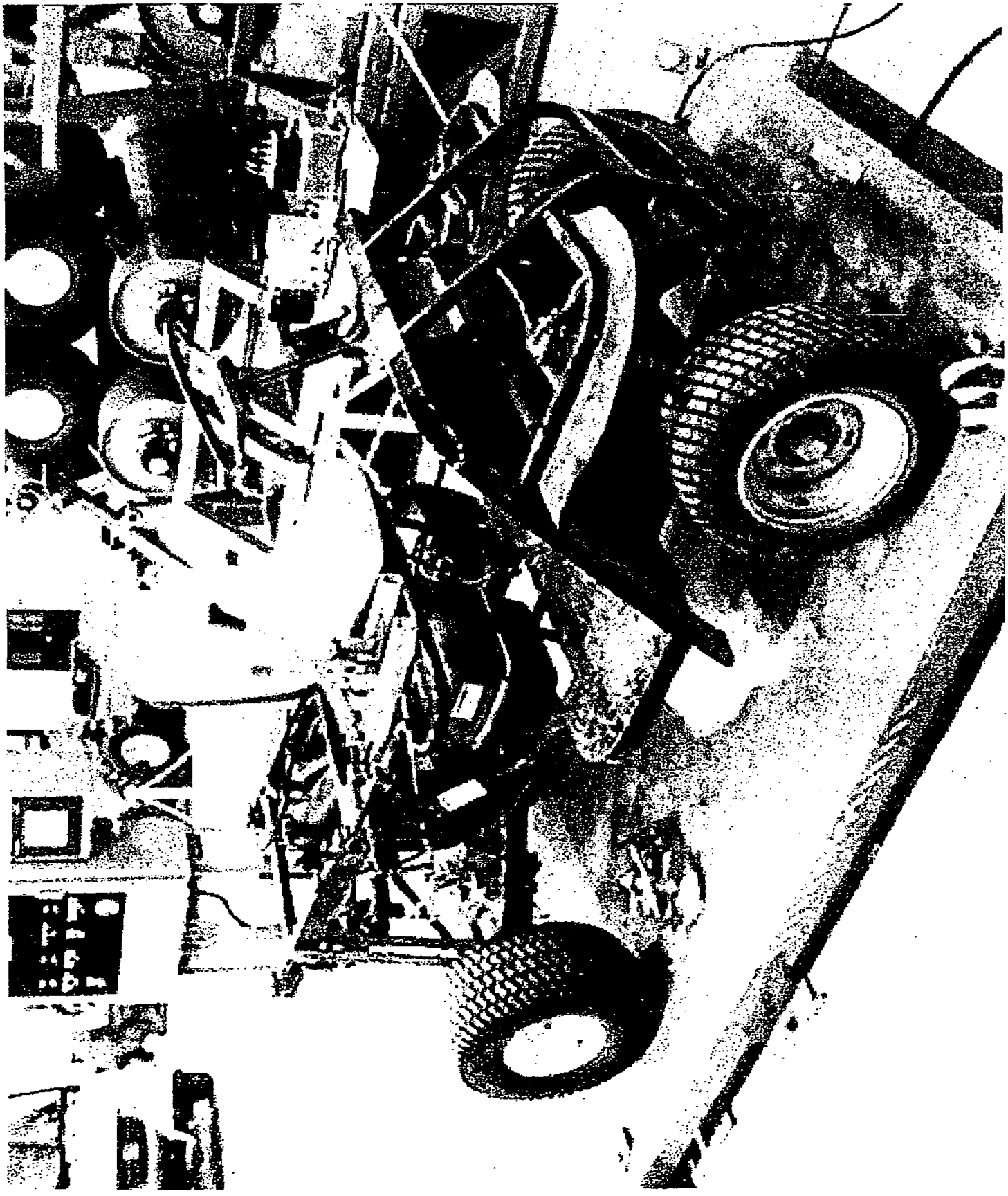


EXHIBIT B

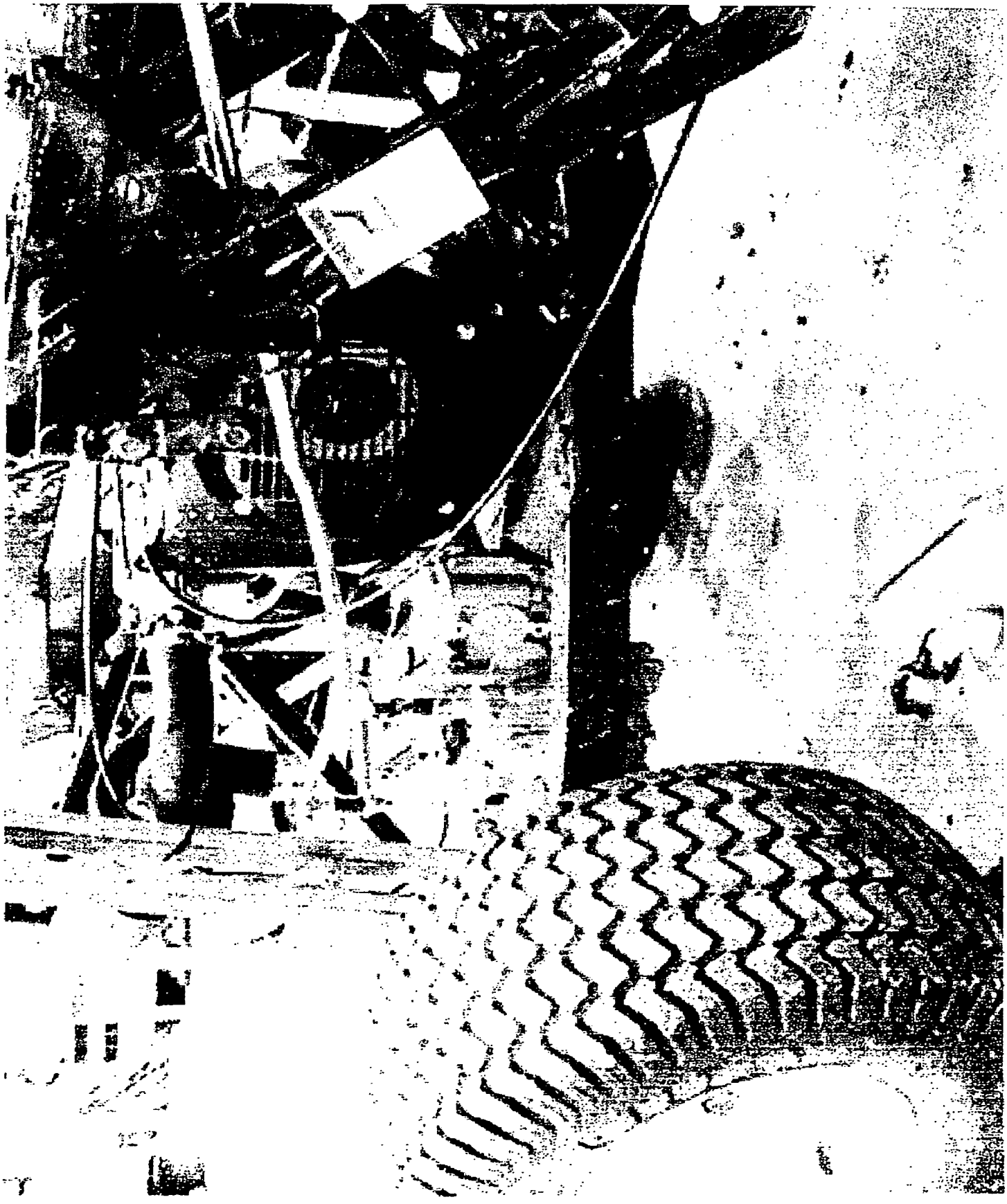


EXHIBIT C

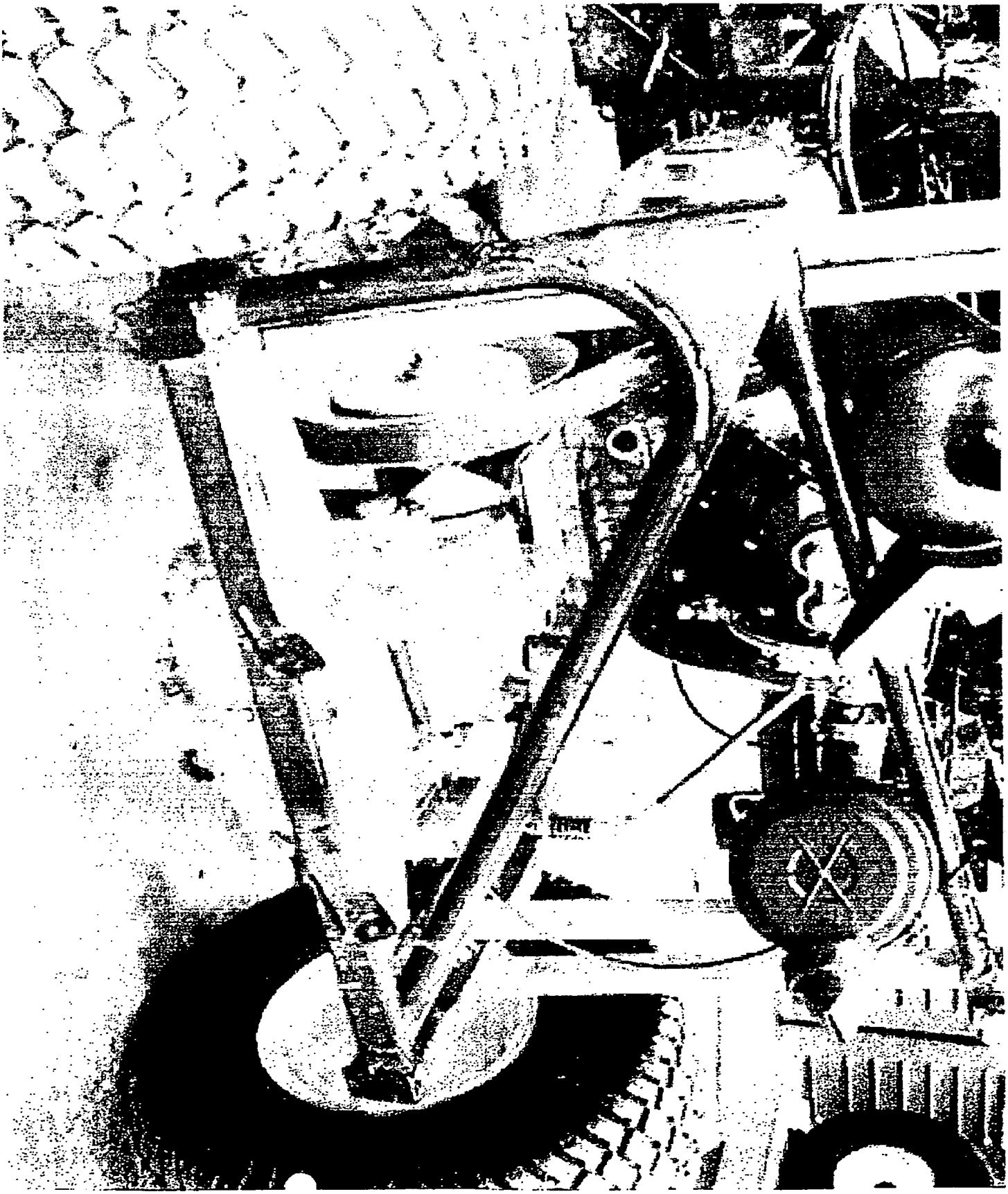


EXHIBIT D

From: Heide Paul
Sent: Friday, May 26, 2000 1:39 PM
To: 'jzarembka@hoffcocomet.com'
Cc: Bedis Mike; Dobrot Steven P; Page Rocky H; Swanson Larry; Parshall Theodore J
Subject: Optimum clutch ratios/relation to 4x2

Am I way out in left field, or can I get better overall performance (high low end torque, high top speed) by using a :

- high overdrive clutch ratio
- lower low clutch ratio
- high final drive ratio

Than using a large driven clutch and lower axle ratio??

I realize there is a reasonable range for an axle drive ratio, but by using a 18:1 ratio with an overdrive of .76, I seem to get more low end torque than using a large driven pulley and smaller axle drive ratio.

What are the tradeoffs?


jeff.xls

Paul Heide
heidepaul@jdcorp.deere.com
Engineer-John Deere Vehicle Group
PO Box 3540, Williamsburg, VA 23187-3540
Voice: (757) 564-2534 Fax: (757) 564-2599

HUV Option II - 8.5 inch driven clutch(94c-790)-fe290 engine-20 inch tire

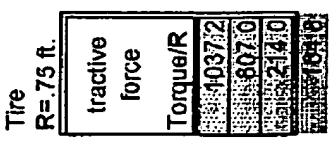
Model	Desired Condition	Engine RPM	Engine Torque (ft-lbs)	Drive Clutch Pitch diameter	Driven Clutch Pitch diameter	CVT ratio	Proposed T/A Ratio	Total ratio CVT*T/A	Axle torque (ft-lbs)	Axle Speed (RPM)	Vehicle Speed (mph)
HUV/HUV-II	High torque	2517.483	14.21	2.70	8.21	3.04	18.00	54.73	777.92	46	2.5
	Torque at 4mph	3682.625	12.27	2.93	8.02	2.74	18.00	49.32	605.25	75	4.0
	maximum speed	3850	11.67	6.33	4.84	0.76	18.00	13.75	160.52	280	15.0
Overdrive limit of clutch		3850	11.67	[illegible]	4.12	0.59	18.00	10.59	123.64	363	19.6

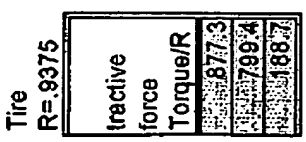
Model	Desired Condition	CVT Ratio	Drive Sheave Diameter	Driven Sheave Diameter	Center Distance	Free Span Length	delta	Belt Length
HUV/HUV-II	Maximum torque	3.04	2.70	8.21	17.00	16.775	0.163	51.585
	Torque at 4mph	2.74	2.93	8.02	17.00	16.808	0.150	51.585
	maximum speed	0.76	6.33	4.84	17.00	16.984	-0.044	51.585

(72c/190d)-4x2 w/25 inch tire

Model	Desired Condition	Engine RPM	Engine Torque (ft-lbs)	Drive Clutch Pitch diameter	Driven Clutch Pitch diameter	CVT ratio	T/A Ratio	Total ratio CVT*T/A	Axle torque (ft-lbs)	Axle Speed (RPM)	Vehicle Speed (mph)
HUV/HUV-II	Maximum torque	2517.483	14.21	2.82	10.68	3.79	15.28	57.87	822.49	44	2.9
	Torque at 4mph	3456.635	12.95	2.82	10.68	3.79	15.28	57.87	749.48	60	4.0
	maximum speed	3850	11.67	7.23	7.17	0.99	15.28	15.15	176.90	254	17.0

Model	Desired Condition	CVT Ratio	Drive Sheave Diameter	Driven Sheave Diameter	Center Distance	Free Span Length	delta	Belt Length
HUV/HUV-II	High torque	3.79	2.82	10.68	17.00	16.540	0.233	56.118
	Torque at 4mph	3.79	2.82	10.68	17.00	16.540	0.233	56.118
	maximum speed	0.99	7.23	7.17	17.00	17.000	-0.002	56.620


Tire
R=.75 ft.
tractive force
Torque/R
1037.2
807.0
2144.0


Tire
R=.9375
tractive force
Torque/R
877.3
799.4
1887

HUV Option II - 8.5 inch driven clutch(94c-790)-fe290 engine-20 inch tire

Model	Desired Condition	Engine RPM	Engine Torque (ft-lbs)	Drive Clutch Pitch diameter	Driven Clutch Pitch diameter	CVT ratio	Proposed T/A Ratio	Total ratio CVT*T/A	Axle torque (ft-lbs)	Axle Speed (RPM)	Vehicle Speed (mph)	Tire R=.75 ft. tractive force Torque/R
HUV/HUV-II	High torque	2517.48	14.21	2.70	8.21	3.04	18.00	54.73	777.92	46	2.5	1037.2
	Torque at 4mph	3682.62	12.27	2.93	8.02	2.74	18.00	49.32	605.25	75	4.0	807.0
	maximum speed	3850	11.67	6.33	4.84	0.76	18.00	13.75	160.52	280	15.0	214.0
Overdrive limit clutch		3850	Error									

Model	Desired Condition	CVT Ratio	Drive Sheave Diameter	Driven Sheave Diameter	Center Distance	Free Span Length	delta	Belt Length
HUV/HUV-II	Maximum torque	3.04	2.70	8.21	17.00	16.775	0.163	51.585
	Torque at 4mph	2.74	2.93	8.02	17.00	16.808	0.150	51.585
	maximum speed	0.76	6.33	4.84	17.00	16.984	-0.044	51.585

Optimum HUV fe290-20 inch tire

Model	Desired Condition	Engine RPM	Engine Torque (ft-lbs)	Drive Clutch Pitch diameter	Driven Clutch Pitch diameter	CVT ratio	Proposed T/A Ratio	Total ratio CVT*T/A	Axle torque (ft-lbs)	Axle Speed (RPM)	Vehicle Speed (mph)	Tire R=.75 ft. tractive force Torque/R
HUV/HUV-II	Maximum torque	2517.48	14.21	3.00	8.00	2.67	27.50	73.33	1042.28	34	1.8	1389.7
	Torque at 4mph	3682.62	12.27	3.23	5.79	1.79	27.50	49.32	605.25	75	4.0	807.0
	maximum speed	3850	11.67	8.00	3.00	0.38	27.50	10.31	120.39	373	20.0	160.5

Model	Desired Condition	CVT Ratio	Drive Sheave Diameter	Driven Sheave Diameter	Center Distance	Free Span Length	delta	Belt Length
HUV/HUV-II	High torque	2.00	3.00	6.00	17.00	16.934	0.088	48.270
	Torque at 4mph	1.79	3.23	5.79	17.00	16.952	0.075	48.270
	maximum speed	0.50	6.00	3.00	17.00	16.934	-0.088	48.270

HUV OPTION-8.5 inch driven clutch(94c-48d)-fe290 engine-20 inch tire

Tire R=.75 ft.

Model	Desired Condition	Engine RPM	Engine Torque (ft-lbs)	Drive Clutch Pitch diameter	Driven Clutch Pitch diameter	CVT ratio	Proposed T/A Ratio	Total ratio CVT*T/A	Axle torque (ft-lbs)	Axle Speed (RPM)	Vehicle Speed (mph)	tractive force Torque/R
HUV/HUV-II	High torque	2517.48	14.21	2.78	8.24	2.96	15.89	47.08	669.22	53	2.9	892.3
	Torque at 4mph	3530.95	12.74	2.78	8.24	2.96	15.89	47.08	599.99	75	4.0	800.0
	maximum speed	3850	11.67	6.05	5.24	0.87	15.89	13.75	160.52	280	15.0	214.0

Model	Desired Condition	CVT Ratio	Drive Sheave Diameter	Driven Sheave Diameter	Center Distance	Free Span Length	delta	Belt Length
HUV/HUV-II	Maximum torque	2.96	2.78	8.24	17.00	16.779	0.161	51.750
	Torque at 4mph	2.96	2.78	8.24	17.00	16.779	0.161	51.750
	maximum speed	0.87	6.05	5.24	17.00	16.995	-0.024	51.750

(72c/190d)-4x2 w/ 25 inch tire

Tire R=.9375

Model	Desired Condition	Engine RPM	Engine Torque (ft-lbs)	Drive Clutch Pitch diameter	Driven Clutch Pitch diameter	CVT ratio	T/A Ratio	Total ratio CVT*T/A	Axle torque (ft-lbs)	Axle Speed (RPM)	Vehicle Speed (mph)	tractive force Torque/R
HUV/HUV-II	Maximum torque	2517.48	14.21	2.82	10.68	3.79	15.28	57.87	822.49	44	2.9	877.3
	Torque at 4mph	3456.84	12.95	2.82	10.68	3.79	15.28	57.87	749.48	60	4.0	799.4
	maximum speed	3850	11.67	7.23	7.17	0.99	15.28	15.15	176.90	254	17.0	188.7

Model	Desired Condition	CVT Ratio	Drive Sheave Diameter	Driven Sheave Diameter	Center Distance	Free Span Length	delta	Belt Length
HUV/HUV-II	High torque	3.79	2.82	10.68	17.00	16.540	0.233	56.118
	Torque at 4mph	3.79	2.82	10.68	17.00	16.540	0.233	56.118
	maximum speed	0.99	7.23	7.17	17.00	17.000	-0.002	56.620

EXHIBIT E

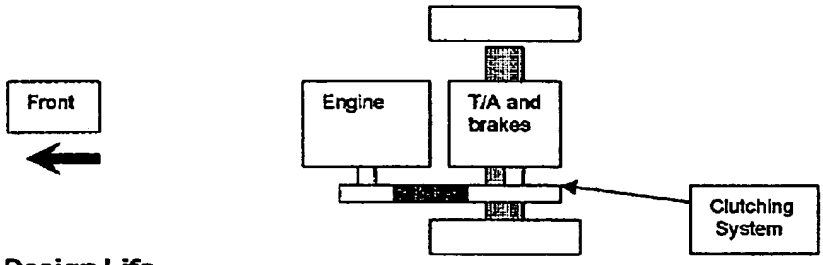
JOHN DEERE WORLDWIDE COMMERCIAL & CONSUMER EQUIPMENT DIVISION COMPONENT SPECIFICATION	Part Number Page 1 of 15
Description: **EO 654 HUV** Specification ***Issued for review by John Deere Co. & Kanzaki*** ***"Preliminary Draft"*** ***Rev. "C" Aug 2000***	Date Issued Aug 2000 Supersedes (date) 6 July 2000
Written by: Rocky Page, Engineer Approved by: Larry Swanson, Staff Engineer EO654 Design: Paul Heide, Vehicle Engineer	Review/Approved Date

Supersedes (date) None	Date Issued	Page 4 of 15	Part Number

1.1.3 Power train layout

- System consists of a transaxle on the rear wheel drive (T/A).
- No suspension on rear
- Brakes included. – Rear only
- V-belt clutch drive input system on left side of transmission

Top View:



1.1.4 Design Life

Definition - Design life is defined as the duration which 90% (B10) of the vehicles will exceed without requiring a rebuild/ replacement of the engine, frame or transmission.

Design Life Table

Item	HUV
Design Life (hours)	500
Average Annual Usage (hrs)	50

1.1.5 Design Validation

John Deere Co. will be responsible for machine field test qualification. John Deere Co. will also test with "Wellend frame cycle test fixture" for structural strength.
Kanzaki will be responsible for completing power train assembly bench testing and making design adjustments prior to second build machines. Kanzaki is expecting to calculate strength and durability of components and analyze housings utilizing Finite Element Analysis.

1.1.6 Cost targets (USA Dollars)

Transaxle	Included	Destination
$300	Transaxle / brakes	Cost at Williamsburg

Supersedes (date) None	Date Issued	Page 9 of 15	Part Number

1.5 Power Train Specification

1.5.1 Transaxle

1.5.1.1 Ratios / Speeds

NOTE: Previsions should be made to accommodate forward final drive ratios from 13:1 to 21.6

Model	Direction	Engine (RPM)	CVT ratio		T/A Ratio	Axle Speed		Vehicle Speed (kph)	
			Low	High		low	High	low	high
All HUVs	Forward	3600	3.11	0.76	17.38	66.6	27.3	5.9	24.3
	Reverse	3600	3.11	0.76	28.97	40	16.4	3.6	14.6

1.5.1.2 Constraints:

- The T/A shall have integral axle tubes that mount directly to a carrier separate from the main vehicle frame.
- The T/A will be belt driven through a torque-sensing clutch with the input shaft on the left side of the vehicle.
- The T/A will provide one forward speed and one reverse speed.
- Furnish Dipstick for oil level check and drain plug.

1.5.1.3 Input shaft

Design input shaft to accept Comet 48d or Comet 190- 216 mm diameter secondary clutch pulley.
Locate on left-hand side of transaxle.

1.5.1.4 Output shafts

1.5.1.5 Mounting

Transaxle is to be securely attached to the vehicle using the axle housing extensions, mounting surface center width is 558.8 mm,(No suspension).

EXHIBIT F

From: Page Rocky H [IMCEAEX-_O=DEERE_OU=JDCORP_CN=RECIPIENTS_CN=MX10344@liebherr.com]
Sent: Friday, December 15, 2000 6:58 AM
To: Heide Paul
Cc: Karl Friesen; Larry Swanson; Paul Schumann
Subject: RE: Reminder of P.O. Release for EO654 1st Prototype

Paul
To move forward I need acceptance of the attached request for green req.

Review with your group and if OK then I can release this to David Reynolds.

also attached is Kanzaki quote referred to .

Rocky

<<Request for Green Requisition SOP17.doc>>

<<Dec6-proto cost.doc>>

-----Original Message-----
From: Heide Paul
Sent: Friday, December 15, 2000 6:43 AM
To: Page Rocky H
Subject: RE: Reminder of P.O. Release for EO654 1st Prototype

Do I need to do anything about this Rocky?

Paul Heide
heidepaul@johndeere.com
Engineer-John Deere Vehicle Group
PO Box 3540, Williamsburg, VA 23187-3540
Voice: (757) 564-2534 Fax: (757) 564-2599

-----Original Message-----
From: usumura@kanzaki.co.jp [SMTP:usumura@kanzaki.co.jp]
Sent: Friday, December 15, 2000 4:19 AM
To: Page Rocky H
Cc: mx10550@deere.com; Friesen Karl H; Schumann Paul H; Swanson Larry; oms@kanzaki.co.jp; kita@kanzaki.co.jp; nakagawa@kanzaki.co.jp; muto@kanzaki.co.jp; oms@kanzaki.co.jp
Subject: Reminder of P.O. Release for EO654 1st Prototype

Dear Mr. Rocky Page,

Regarding this matter, we have informed you of the prototype cost in the e-mail
of 6 Dec. 2000. It would be highly appreciated if you would give us an Purchase
Order immediately.

Thank you and best regards,

Masanori Usumura
Overseas Marketing Section,
Marketing Department
Kanzaki Kokyukoki Mfg. Co., Ltd.
Tel: 81-6-6491-7185
Fax: 81-6-6494-6829
E-mail: usumura@kanzaki.co.jp

KANZAKI KOKYUKOKI MFG. CO.,LTD.

Overseas Marketing Section, Marketing Dept.
2-18-1, Inadera, Amagasaki, Hyogo 661-0981 Japan.
TEL. 06-6491-7185, 6494-6743 FAX. 06-6494-6829

Date : 6 December, 2000
To : Mr. Rocky Page, Engineer, Transmission & Hydraulic Component Development
John Deere Worldwide Commercial & Consumer Equipment Division
CC : John Deere / Mr. Larry Swanson, Mr. Paul Schumann, Mr. Paul Heide,
Mr. Karl Friesen,
Kanzaki / Fujisaki, Otsuki, Hasegawa, Inoue, Morisaki, Watanabe, Magara, Kita, Nakagawa, Muto
From : Masanori Usumura, Overseas Marketing Sect., Marketing Dept.,
Kanzaki Kokyukoki Mfg. Co., Ltd.

Subject : EO654 1st Prototype Cost for P.O. Release

Dear Mr. Rocky Page,

As per the telephone conference of 15 November, 2000(our time), we are pleased to inform you of the Prototype T/A Cost as follows, so please release the P.O. accordingly :

JD Due Date	Component	Qty	Cost Each	Total
Early Feb. 2001	EO654 T/A w/ Diff. Lock	1	\79,800	\79,800
29 March 2001	EO654 T/A w/ Diff. Lock	16	\79,800	\1,276,800

If you find something wrong regarding the due date and the quantity, please let us know by return.

Thank you and best regards,

MU/mu

Sample procurement information
Eo654 1st build transmission samples

1) Initiates green requisition.
2) Records
   a) Green req. number.
   b) P.O. number.
   c) Invoice number.

Info required for Green Requisition

Supplier address / Supplier number / Contact	Supplier # 0020135 Kanzaki Kokyukoki MFG. Co., LTD 2-18-1 Inadera Amagasaki, Hyogo, 661-0981 Japan Attn: T. Inoue
Description (Part number if available)	Transaxle
Quantity	17
Delivery Due Date	5 Feb 2001 (1) assembly 29 March 2001 (1) assemblies 19 April 2001 (4) assemblies 26 April 2001 (4) assemblies 3 May 2001 (4) assemblies 10 May 2001 (3) assemblies
Deliver to address and attention	John Deere Horicon works 300 N. Vine Street Horicon, WI. 53032-1100 Deliver material to: 541R mail code –attention Rocky Page mx10344– back up contact Barbara Groleau
Cost	79,800 Yen each x 17 = 1,356,600
Eo project number	Eo654
Requested by:	Rocky Page

Additional info

Design coordinator:	David Reynolds
Green req. number:	
Vehicle group engineer contact:	Paul Heide
P.O. number	
Invoice number	

EXHIBIT G

From: Page Rocky H
Sent: Tuesday, March 13, 2001 1:43 PM
To: Heide Paul
Subject: RE: HUV sample transmission

Thanks for the update

-----Original Message-----
From: Heide Paul
Sent: Tuesday, March 13, 2001 1:41 PM
To: Page Rocky H
Cc: Friesen Karl H; Dobrot Steven P; Bedis Mike; 'mhuddleston@hoffcocomet.com'
Subject: HUV sample transmission

Rocky,

I had a chance to ride the Mule 550 with sample K/K trannie, 4x2 engine, and Comet HUV prototype clutches.

It was loaded to 1500 lbs.(700 lb. vehicle, 400 lb. people, 400 lb. cargo)

In riding around on our 'flat land' with it's pathetic hills, I would say that the GVW HUV had superior low end power as compared to a GVW 4x2.

I pushed against a dumpster with 1000 lbs. over the rear axle and was able to get about 18 inches of wheel spin with a full load. More importantly, The T/A did not blow up.

Clamping force seemed reasonable.

Diff lock engaged and disengaged correctly.

Full speed of vehicle was only 11 mph because the clutches did not provide correct overdrive. (goal is .76:1, vehicle was 1:1)

Shift effort into forward and into reverse was low with no gear grind.

Back shift was similar to or superior to 4x2.

No opinion on engagement until clutches are tuned.

Belt drag is unacceptable for it causes vehicle creep and makes it tough to get the T/A out of gear.

Because of the mid shaft shifter, we get a multiplier of belt drag force through the input gear set. We really want to get a handle on this because I was stuck on a hill and had to turn off the engine in order to get the T/A out of gear.

Mike Huddleston of Comet has ridden the vehicle and will work to remedy the problems when he gets the vehicle this week.

For a first pass, many things are fine, some need tweaking.

Paul Heide
heidepaul@johndeere.com
Engineer-John Deere Vehicle Group
PO Box 3540, Williamsburg, VA 23187-3540
Voice: (757) 564-2534 Fax: (757) 564-2599

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